

# **IAI**

Indoor Air International

International Symposium  
on  
Indoor Air Quality in Asia

28-29 November 1991  
Central Plaza Hotel  
Bangkok, Thailand

## **Programme & Abstract Book**

The International Association for Indoor Air Quality  
Postfach 2, CH-4467 Rothenfluh, Switzerland

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PROGRAMME  
SATELLITE SYMPOSIUM ON  
INDOOR AIR QUALITY IN ASIA

Thursday, November 28th 1991

09.00-09.30	OPENING REMARKS	
	- B R Reverente	(Philippines)
	- U Sudsukh	(Thailand)
	- K Chanawong	(Thailand)
09.30-10.30	KEYNOTE LECTURES	
	Chair: B R Reverente	(Philippines)
09.30-10.00	"Legionella: Facts & Fiction" (A1)	
	by: H Garnett	(Australia)
10.00-10.30	"Indoor Environmental Factors & Health: The Need for Common Sense" (A2)	
	by: F J C Roe	(UK)
10.30-10.45	COFFEE BREAK	
10.45-12.25	PLENARY SESSION	
	Chair: F S He	(P R China)
10.45-11.05	"Reliability of Questionnaire Data" (A3)	
	by: J Kagawa	(Japan)
11.05-11.25	"Is Incense Hazardous to Health?" (A4)	
	by: <u>L C Koo</u> & J H-C Ho	(Hong Kong)
11.25-11.45	"Indoor Air Quality Survey in Manila Buildings" (A5)	
	by: B R Reverente	(Philippines)
11.45-12.05	"Indoor Air Quality & Building Related Issues" (A6)	
	by: L K Quah	(Singapore)

12.05-12.25	"A Critique of the Methodology Used to Assess Toxic Effects on Man from Combustion Products" (A7) by: D F Weetman (UK)
12.25-13.30	LUNCH
13.25-14.45	Chair: J Kagawa (Japan)
13.25-13.45	"Indoor Air Quality in Hong Kong: Data Analysis" (A8) by: J Bacon-Shone (Hong Kong)
13.45-14.05	"Indoor Air Quality in Hong Kong: Sampling & Laboratory Analysis" (A9) by: S S T Liao (Hong Kong)
14.05-14.25	"Thermal Comfort & Air Quality in Naturally Ventilated Indoor Environments" (A10) by: L M Ferrer (Philippines)
14.25-14.45	"The Impact of Ventilation on Indoor Air Quality: Meeting Health Standards" (A11) by: L C Holcomb (USA)
14.45-15.00	COFFEE BREAK
15.00-16.30	Chair: I M Fihir (Indonesia)
15.00-15.20	"Indoor Air Quality: Problems & Solutions" (A12) by: J Robertson (Australia)
15.20-15.40	"Neurotoxic Effects of Carbon Disulfide on Rayon Workers" (A13) by: FHe, Z Zhang, S Yang & S Zhang (P R China)
15.40-16.00	"Vehicle Emissions - Indoor/Outdoor Air Quality Considerations" (A14) by: R Perry (UK)
16.00-16.20	"The Environmental Impact of Carcinogens from Motorcar Exhausts" (A15) by: M Buck (Germany)

16.20-16.40 "How Do We Establish Priorities for the  
Amelioration of Indoor Air Pollution" (A16)  
by: G B Leslie (UK)

19.00 Sunset Cruise on AYUTHAYA PRINCESS

Friday, November 29th 1991

Room A

09.00-09.50 Indoor Air International - Council Meeting  
(Council Members only)

Room A Chair: S S T Liao (Hong Kong)

10.00-10.20 "Prevalence of Welders' Pneumoconiosis in  
Welders Exposed to Complex Welding Fumes"  
(with Autopsy Report of 5 Cases) (A17)  
by: C Zou, K Xing, Y Hou  
& Z Mao (P R China)

10.20-10.40 "Control of Welding Fumes in the Metal  
Fabrication Industry" (A18)  
by: R C Panjwani (India)

10.40-10.55 COFFEE BREAK

Room B

09.00-09.20 "PIXE Application to Indoor Air Quality" (A19)  
by: T Ro, T Ishiguro,  
M Fujimura &  
Y Hashimoto (Japan)

09.20-09.40 "Source Identification of Airborne  
Particulate Matter in Urban, Suburban  
& Industrial Areas in Korea" (A20)  
by: S-O Baek (Korea)

09.40-10.00 "Sources & Indicators of Indoor Air Pollution  
in the Occupational Setting in Indonesia"  
(A21)  
by: D Soedirman (Indonesia)

10.00-10.20 "Indoor Air Quality of Urban Shopping  
Facilities in Jakarta, Indonesia" (A22)  
by: U F Ahmadi & I M Fihir (Indonesia)

10.20-10.40	"Airborne Radon Concentrations in Seoul Metropolitan Subway Stations" (A23)	
	by: <u>Y S Kim</u> & D-S Kim	(Korea)
10.40-10.55	COFFEE BREAK	
Room A	Chair: B I Castleman	(USA)
10.55-11.15	"Standardization of the Measurement of Asbestos Fibres in Indoor Air" (A24)	
	by: N Hoefert	(Germany)
11.15-11.35	"The Contamination of Indoor Air with Asbestos and Man-made Mineral Fibres" (A25)	
	by: J A Hoskins & R C Brown	(UK)
11.35-11.55	"Asbestos Concentrations in Indoor Air and Management of Asbestos Removal Works in Japan" (A26)	
	by: <u>S Toda</u> & M Aoyagi	(Japan)
11.55-12.15	"Control of Dusts for Small Cement Factories with Shaft Kilns" (A27)	
	by: <u>G Q Liu</u> , J Liu & Z Chen	(P R China)
12.15-12.35	"Threshold Limit Values: A Hazardous Export" (A28)	
	by: B I Castleman	(USA)
12.35-13.30	LUNCH	
Room B	Chair: H H Lim	(Malaysia)
10.55-11.15	"The Air Concentrations of Pyrethroids in Dividing and Packing Workshops" (A29)	
	by: <u>P P Yao</u> , J Sun, Y Wu, L Liu & F He	(P R China)
11.15-11.35	"Industrial Pollution in Vietnam, an Important External Source of Indoor Air Pollution" (A30)	
	by: L V Trung	(Vietnam)

- 11.35-11.55 "Health Problems in a Thermoelectric Plant in Vietnam" (A31)  
by: N D Nguyen, P.N Len  
& N T Dung (Vietnam)
- 11.55-12.15 "An Occupational Health Survey in Establishments Exposed to Motor Vehicle Emissions" (A32)  
by: L C Somera (Philippines)
- 12.15-12.35 "Protection of Indoor & Outdoor Air at Work with Highly Toxic Substances" (A33)  
by: N Z Bitcolov & V Y Zharkov (USSR)
- 12.35-13.30 LUNCH  
Room A
- 13.30-15.30 Chair: N Mahabhol (Thailand)
- 13.30-13.50 "Indoor Noise Sources and Levels" (A34)  
by: S E Lee (Singapore)
- 13.50-14.10 "Further Analyses of the Role of Confounding Variables in Epidemiologic Studies of ETS and the Respiratory System in School-age Children" (A35)  
by: R J Witorsch, J M Wu,  
R D Hood & P Witorsch (USA)
- 14.10-14.30 "The Health Consequences of Homemakers Exposure to Indoor Pollutants" (A36)  
by: T D Sterling, D A Sterling  
& C W Collett (Canada)
- 14.30-14.50 "Continuous Measurement of Indoor Air Quality in Office Buildings in Japan" (A37)  
by: A Ito (Japan)
- 14.50-15.10 "Indoor Air Quality, Ventilation and Energy Saving" (A38)  
by: Q Chen (P R China)

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15.10-15.30 "Refrigerating with Waste Heat on Site to  
Improve Working Conditions" (A39)  
by: J Liu, X Liu & C Sun (P R China)

15.30 END OF CONFERENCE

15.45-17.00 IAI General Assembly  
(IAI members only)

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POSTERS

- P1 "How Safe are the Maximal Exposure Levels of Carbon Monoxide?" (A40)  
G Krstic & D F Weetman - UK
- P2 "Non-Occupational Exposure to Lead in an Occupational Setting" (A41)  
E Yano - Japan
- P3 "Airborne Asbestos Concentrations in Rooms Sprayed with Asbestos-Containing Materials" (A42)  
K Sakai, N Hisanaga, K Mitani, H Tsuchiya, J Huang, E Shibata, Y Ono, A Kojima & Y Takenohi - Japan
- P4 "Research on Climatic Conditions and Health Standards in Underground Constructions" (A43)  
X Liu & J Liu - P R China

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ABSTRACT 1

Legionella: Facts and Fiction.

Helen M Garnett, Department of Biology, University of Wollongong, PO Box 1144, Wollongong, Australia 2500.

Legionella species are known to cause two disease syndromes: Legionnaires' disease and Pontiac fever. The documented incidence of Legionnaires' disease has increased with the increased awareness of the syndrome. Although it is a fact that most deaths occur in older age groups, that young people do not contract the disease is fiction. Whether young people contract a mild form of the disease and whether this then predisposes them to subsequent respiratory problems has not been elucidated. Even though Pontiac fever is stated in some reports to be a rare illness, the question arises, "Do we know this to be true?", since epidemiological studies suggest that a high proportion of the Australian population have antibodies to Legionella and may have suffered some symptoms due to infection. And although Legionella pneumophila type 1 is generally considered to be the most important species causing disease, is this fact or fiction? Studies in Australia suggest that Legionella longbeachae is a common cause of Legionnaires' disease.

Many guidelines for the maintenance of cooling towers suggest that a total plate count of  $5 \times 10^5$  cfu/ml for cooling tower water indicates a reasonably clean system. However, as our studies suggest that significant numbers of Legionella species can be found in water bodies with such bacterial counts, are the guidelines based on fact or fiction?

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ABSTRACT 2

Indoor Environmental Factors and Health: The Need For Common Sense.

F J C Roe, Wimbledon, London, UK.

Several factors contribute to making the indoor environment different from the outdoor environment: the list includes the sheltering effect of roofing and walls, indoor sources of cooking and heating fumes, chemicals and particles including fibres emitted by building materials and fabrics, domestic chemicals including insecticides, the occupying people and their hobbies, animal pets, and mechanical systems for raising or lowering temperature and humidity. Where there are no effective barriers between the indoor and outdoor environments then the quality of the outdoor air is likely to be the most important determinant of the quality of the indoor air. In certain circumstances radon daughters and possibly asbestos fibres may contribute to lung cancer risk. However, in most countries cooking and heating fumes - especially the carbon monoxide, oxides of nitrogen and particulate content of such fumes - are by far the most important contributors to the risk of chronic lung disease, including lung cancer, from indoor air pollution. However, the spread of infections, particularly organisms that cause upper respiratory disease, and allergies, particularly from house dust mites and fungal spores, are responsible for most of the short term illnesses due to poor indoor air quality. The need to pay more attention to the importance of the spread of infectious diseases in indoor environments will be discussed.

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#### ABSTRACT 3

##### Reliability of Questionnaire Data.

Jun Kagawa, Department of Hygiene and Public Health, Tokyo Women's Medical College, Tokyo, Japan.

A study involving 4422 Yokohama city school-children was carried out: each child had an annual examination that consisted of a respiratory symptom questionnaire completed by a parent, and a measurement of the cotinine present in an early morning urine sample. Data from the cohort who responded to the questionnaire in both 1986 and 1988 were examined. Inconsistency of response was large. For example, the response to a question of the past history of bronchial asthma varied from 20.3% to 50.0%. Exposure to environmental tobacco smoke (ETS) in children is usually classified according to parental smoking habits. However, when urinary cotinine concentrations were used to determine exposure to ETS in children in the present study, cotinine was not detected in 61.6% of 2873 children whose parents were smokers, and in 63.9% of 1549 children whose parents were nonsmokers, according to reported parental smoking habits. In another study, daily urinary cotinine of 12 nonsmokers was measured for one month. Urinary cotinine was detected in 59% of the people who reported ETS exposure in the previous day, and in 21% of the people who reported no ETS exposure in the previous day. These data suggest limitations to usefulness of both questionnaire and urinary cotinine measurement as biological markers of ETS exposure.

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#### ABSTRACT 4

##### Is Incense Hazardous to Health?

L C Koo and J H-C Ho, Cancer Research Laboratory, Hong Kong Anti-Cancer Society, Nam Long Hospital, Wong Chuk Hang, Hong Kong.

In Asian societies, the burning of incense in homes, shops, and temples is a source of air pollution. In order to assess its dosage, carcinogenic compounds, and possible health risks, data from 3 epidemiological studies in Hong Kong were analyzed.

Incense is burned on any given day, in about 50% of homes: usually 3 sticks twice per day. Incense is a significant contributor to carcinogenic polycyclic aromatic hydrocarbons like benzo-a-pyrene in the airborne dust of homes. Women living in homes that burned incense had significantly higher personal levels of exposure to nitrogen dioxide than those living in homes where incense was not burned. Although there was no significant increase in risk of respiratory symptoms among women who had never smoked when they were exposed to home incense burning, there was an increase in reported wheezing among children so exposed that was of borderline significance (t-test p-value 0.10). There was no increase in risk for lung cancer among women who had never smoked who were exposed to incense burning. Among those women who had ever smoked, the more frequent the incense burning per month, the higher the risk for lung cancer, whereas with increasing years of exposure, there was an associated lower risk. There was no increase in risk for lung cancer associated with visiting Chinese temples.

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ABSTRACT 5

Indoor Air Quality Survey in Manila Office Buildings.  
B R Reverente, Manila, Philippines.

Concern over indoor air quality in offices is increasing among occupational medical practitioners in the Philippines. To determine the extent of this concern, a survey was conducted by questionnaire among the medical directors of companies with offices in Metro Manila. Items surveyed included type of air conditioning, air exchanges, symptoms among employees attributable to indoor air quality, and any intervention measures used. A preliminary report of the results of the questionnaire survey will be presented. This survey is part of a larger research project which includes air sampling studies of the indoor air in these offices.

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ABSTRACT 6

Indoor Air Quality and Building-Related Issues.  
L K Quah, School of Building and Estate Management, National University of Singapore, Singapore.

A number of studies have related the quality of indoor air to the ventilation system in a building. This paper will draw attention to other issues such as the design, construction and maintenance of the building structure, fabric and services and their effects on indoor air quality.

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#### ABSTRACT 7

A critique of the methodology used to assess the toxic effects on man of combustion products.  
D F Weetman, School of Pharmacology, Sunderland Polytechnic, Sunderland, SR3 1SD, England.

Many chemicals are formed in the oxidation that takes place when organic, or organically-derived, material is burnt for heating, cooking, lighting or other social purposes. Combustion occurs without sufficient oxygen or time for complete oxidation, and is complicated by the process of pyrolysis, where oxygen is not consumed but molecular rearrangements occur; thus complex molecules are formed. Man is exposed to this mixture of chemicals both at home and in the workplace, so reliable methods are needed to evaluate any effects on health.

The composition of any organic material will determine the chemicals that result from its combustion, but in general there is very little variation in the types of chemical formed. Amongst the simplest molecules are the oxides of carbon, nitrogen, and sulphur; also present are hydrocarbons, aldehydes, phenols and organic acids; whereas most attention has been paid to the carcinogenic potential of polycyclic organic molecules. The importance of particles, especially respirable particles (i.e. those of dimension that may be inhaled and retained for a time in the lung), is central to any toxicological consideration, because these can deliver chemicals adsorbed on their surface to specific sites in the respiratory tract.

Evaluation of health effects can be achieved in epidemiological studies, and from simulation of pathological mechanisms by exposure of human and animal tissue to potentially toxic chemicals in laboratory studies. Both methodologies are prone to error according to the assumptions made by the investigators in designing their studies, as are any attempts at risk assessment. The assumptions made in the different types of investigation can compromise the validity of the findings: this will be illustrated by reference to specific cases.

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#### ABSTRACT 8

Indoor Air Quality in Hong Kong: Data Analysis.  
J Bacon-Shone, Social Science Research Centre, University of Hong Kong, Pokfulam Road, Hong Kong.

This talk will discuss the data analysis of a study of indoor air quality in Hong Kong. Air quality was measured inside and outside 30 open shops and 30 offices in Hong Kong. Although the sampling sites were not a random sample, the results give a good indication of the sort of air quality problems that exist in Hong Kong. The use of measurements inside and outside each site, enables some investigation of the relationship between the air inside and outside. The method of analysis used, based on ranks, is not sensitive to extreme values, and has no difficulties with values below measurable limits. Principal components analysis of the ranked data is used to assist in identifying possible sources of the pollutants.

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ABSTRACT 9

Indoor Air Quality Evaluation in Hong Kong: Sampling and Analysis.

S S T Liao, EHS Consultants Ltd, 1503 Eastern Commercial Centre, 393-407 Hennessy Road, Hong Kong.

A pilot study on the indoor air quality of 35 shops and offices was conducted in the summer of 1990. The samples selected were not entirely random due to accessibility restrictions but they were selected to represent different areas in the territory. For the shop samples, they were all located at ground floor level opening directly into the streets where the worst scenario of traffic pollution were usually found. For the offices, a selection was made to represent different size offices, ranging from 5 occupants to over 200, and ventilation systems ranging from window type unit to central air conditioning systems. The analytes collected includes CO, CO<sub>2</sub>, RSP, UV-RSP, nicotine, NO<sub>2</sub>, volatile organics (benzene, toluene and xylene), fungi and bacteria. The calibration of equipment, instrumental detection limits and analytical procedures were discussed in the paper identifying limitations and suggesting future modifications.

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ABSTRACT 10

Thermal Comfort and Air Quality in Naturally-Ventilated Indoor Environments Under Hot-Humid Conditions.

Luis M Ferrer, University of Santo Tomas, Manila, Philippines.

Thermal comfort and indoor air quality are two of the problems associated with naturally-ventilated indoor environments under hot-humid conditions. To a certain extent, these problems can be addressed by the proper design of the building envelope and by other passive methods. This is particularly important in developing countries where the occupants of a substantial number of homes cannot afford active and mechanical means of environmental control. Particular attention should be given to these methods to maximize thermal comfort and improve the indoor air quality.

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ABSTRACT 11

The Impact of Ventilation on Indoor Air Quality: Meeting Health Standards.

L C Holcomb, Holcomb Environmental Services, Olivet, Michigan, USA.

Indoor air quality is the subject of increasing concern. Often there is a lack of understanding of the issue, especially as it relates to providing an indoor air environment where health is protected.

A visual means of illustrating indoor air quality, the parameters which affect it and how it compares with occupational health standards will be presented, taking as an example, environmental tobacco smoke as a point source and examining the changes in indoor air quality that result from variation in ventilation.

2025826016

ABSTRACT 12

Indoor Air Quality - Problems and Solutions.

J Robertson, Healthy Buildings International, Roseville, NSW 2069, Australia.

Poor air quality, comfort levels, ergonomics, noise, lighting and control of temperature and humidity have all been cited as factors that detract from a building's internal environment, although the job satisfaction, stress, clothing and gender of a building's occupants may affect the subjective response of an individual to a given building. In studies on almost 700 buildings worldwide, the cause of poor indoor air quality is given as inadequate ventilation and considerable evidence is available that indicates most sickness and absenteeism to be due to upper respiratory illness, possibly caused by a build-up of indoor pollutants. Indoor air pollution, the result of hundreds of gases, vapours, fibres, dusts, and micro-organisms, can be minimised with effective ventilation strategies.

The identification of source and effective cost, of indoor pollutants using generic engineering principles will be examined, and the evolution of ventilation standards and the cost dynamics of inappropriate ventilation standards will be discussed.

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ABSTRACT 13

Neurotoxic Effects of Carbon Disulfide on Rayon-Production Workers.

Fengsheng He, Zheming Zhang, Shi Yang and Shoulin Zhang, Institute of Occupational Medicine, Chinese Academy of Preventive Medicine, 29 Nan Wei Road, Beijing 100050, China.

Carbon disulfide ( $CS_2$ ), used widely as a raw material in the production of rayon, is a neurotoxin known to affect both the central and peripheral nervous systems. In this study, neurological and electroneurophysiological examinations were conducted to assess the neurotoxic effects of exposure to 14.2-29.0 mg/m<sup>3</sup>  $CS_2$  on workers in a rayon factory. A Dantec 2000C electroneuromyograph was used to detect the electromyography (EMG), nerve conduction velocity (ENG) and somatosensory, brainstem auditory, and visual-evoked potentials (SEP, BAEP and VEP respectively) in 96  $CS_2$  - exposed workers and 50 unexposed controls.

The  $CS_2$ -exposed group experienced headache (82.7%), insomnia (57.5%), deterioration of memory (46.7%), numbness in hands and feet (46.9%) and demonstrated symmetric and distal sensory deficits; 7% showed EMG abnormalities. There was a reduction of the ENG, prolongation of distal sensory latency and diminution of amplitude of distal sensory potentials in median, ulnar, peroneal and sural nerves compared with the control group. Twelve of 35  $CS_2$ -exposed workers tested showed a reduction of the ENG in two nerves yet had no clinical signs of neuropathy. EMG and ENG thus proved to be sensitive methods for detecting  $CS_2$  neuropathy. The SEP study revealed prolongation of conduction time in the spinal cord although no abnormality was found in BAEP and VEP measurements in the  $CS_2$ -exposed group. The results suggest that  $CS_2$  exposure in the studied group induced damage mainly in the peripheral nervous system.

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ABSTRACT 14

Vehicle Emissions - Indoor/Outdoor Air Quality Considerations.

Roger Perry, Imperial College Centre for Toxic Waste Management, London SW7 2BU, UK.

The factors influencing air quality arising from road vehicles will be discussed with reference to both petrol and diesel engines; the influence of climate and continued atmospheric chemical reactions in outdoor air will be considered in relation to legislative changes that have taken place; the methods available for the control of vehicle emission will be reviewed; and vehicles as sources of combustion products will be put into perspective with other sources of emission in urban situations. Detailed knowledge of the factors that influence changes in indoor air quality is much more limited and the approach to control less rational and scientific than that used in outdoor air.

Such factors need careful appraisal and further research in a situation where the balance between outdoor and indoor air quality is critically important and varies significantly between countries of the developed and developing world.

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ABSTRACT 15

The Environmental Impact of Carcinogens from Motorcar Exhausts.

Manfred Buck, State Institute for Air Pollution Control, Essen and University of Bochum, Germany.

In Germany, air quality guidelines, established by risk assessment, for a number of carcinogenic air pollutants, have been proposed recently by an expert committee. Among these pollutants are several constituents of motorcar emissions, such as benzene, diesel soot (elemental carbon) and benzo[a]pyrene. Systematic measurements of these pollutants have been carried out during recent years, predominantly in busy streets or close to other traffic "hot spots". Some of these measurements have been performed simultaneously on outdoor and indoor air and on air inside motorcars.

An indoor to outdoor concentration ratio of 0.8 was estimated for benzene, whereas for particulate lead, a value of 0.3 was found, which has been assumed to be representative of both benzo[a]pyrene and diesel soot. These figures allow for calculation of the magnitude of motor traffic-induced indoor air concentrations and, thereby, the cancer risks for people living in dwellings near to busy roads. These findings will be evaluated with reference to the German air quality guidelines.

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ABSTRACT 16

How do we establish Priorities for the Amelioration of Indoor Air Pollution?

G B Leslie, Biggleswade, UK.

There has been a tendency to follow the lead of developed "Western" countries in assessing the health risks from indoor air pollutants and in trying to reduce air pollution. Since in even the most affluent nations, resources in expertise and finance have limitations, it is essential to establish criteria for identifying sources of indoor air pollutants, for assessing the health risks and economic costs which they represent, and for prioritising measures which should be taken to deal with them.

These assessments and priorities will vary considerably between countries depending upon their climate, economic status, culture and social and political structure. Countries in Asia can learn from other nations but should work towards their own individual approaches to the problems of indoor air pollution.

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ABSTRACT 17

Prevalence of Welders' Pneumoconiosis in Welders Exposed to Complex Welding Fumes.

Changqi Zou, Kangji Xing, Yuxi Hou\* and Zongshu Mao\*,  
Institute of Occupational Medicine, Chinese Academy of Preventive Medicine, Beijing, China. \*Department of Occupational Disease of Dalian Shipyard, China.

This paper reports the prevalence of welders' pneumoconiosis in 368 welders in the Dalian Shipyard of China who were exposed to complex welding fumes that contain elements of Fe, Mn, Ni, Cr and SiO<sub>2</sub>. The concentration of welding fumes in the workplace was 5-312 mg/m<sup>3</sup>. Clinical examination of 368 welders from 1950 - 1985 indicated 38 cases of welders' pneumoconiosis (37 in category I, 1 in category II). The prevalence of the disease was 10.33% in a population with an average working life of 34 years. Symptoms of the disease were not very serious. Chest X-ray of welders' pneumoconiosis characteristically showed small irregular and small round opacities. Pathological observation of 5 autopsy cases of welders' pneumoconiosis showed dust-laden fibrotic foci, nodules and interstitial fibrosis. Based on elemental analysis of lung tissues, the contents of Fe and Mn were 50-200 fold more than in those without, and with other forms of, pneumoconiosis; however, the contents of free SiO<sub>2</sub> were 10 fold lower than in those with other forms of pneumoconiosis. It is suggested that the interreactions of Fe, Mn and other metal components of welding fumes may cause and/or promote fibroplasia of lung tissues. However, free SiO<sub>2</sub> is unlikely to be a direct cause in the pathogenesis of welders' pneumoconiosis.

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ABSTRACT 18

Control of Welding Fumes in the Metal Fabrication Industry.  
R C Panjwani, Powai Works, Saki Vihar Road, PO Box 8901,  
Bombay, India.

Welding, although not an industry in the strict sense in which the term is used, is, in fact, a ubiquitous process, for the application of welding is now so widespread that there is no metal industry or branch of engineering where welding is not used in one form or another. The fumes evolved during different welding processes have been shown to be potentially hazardous and the extent of the hazard is dependent on the quantity of material present in the gas/vapour medium, the composition of the fumes and gases, and their concentration in the air that a welder inhales during welding. A case report of metal fume fever due to inhalation of copper oxide during argon welding, using monel electrode will be described. Lung function tests among 41 arc welders with more than 10 years experience showed higher incidences of both obstructive and restrictive effects on lung function in welders who smoked compared with those welders who were non-smokers. Control of welding fumes will be discussed with particular reference to general ventilation, work area and various mechanised systems of prevention of exposure to fumes.

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ABSTRACT 19

PIXE Application to Indoor Air Quality Measurement.  
Toshitami Ro, Takeshi Ishiguro, Mitsuru Fujimura\* & Yoshikazu Hashimoto\*\*, Technical Research Laboratory, Takenaka Corporation, 5-14-2 Minamisuna, Koto-ku, Tokyo 136, Japan.  
\*Nippon Environmental Pollution Control Centre Inc, 5-4-11 Higashi-kojiya, Ota-ku, Tokyo 144, Japan. \*\*Department of Applied Chemistry, Keio University, 3-14-1 Hiyoshi, Yokohama, 223 Japan.

The measurement of suspended particulate matter (SPM) is normally carried out to assess indoor air quality; however, Particle Induced X-ray Emission (PIXE), a highly sensitive method for multi-elemental analysis, can provide a more detailed evaluation of air quality. The PIXE method makes it possible to measure elemental concentrations hourly, and the changes in such elemental concentrations can help to identify emission sources. PIXE analysis of SPM has been carried out in office and hotel buildings and in atmospheric air in Tokyo. Outdoor elemental contaminations of air were shown to be removed by building ventilation systems; for example, soil source elements were consistently low indoors compared with outdoors. The source of the high indoor levels of potassium appeared to be cigarette smoke. The results show the importance of the measurement of elements when carrying out indoor air quality studies.

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#### ABSTRACT 20

Identification of the Sources of Airborne Particulate Matter in Urban, Suburban, and Industrial Areas.

Sung-Ok Baek, Department of Environmental Engineering, Yeungnam University, Kyungsan 713-749, Korea.

In recent years, there has been considerable concern over the application of receptor-oriented models both to the identification of the sources of ambient suspended particulate matter (SPM) and to the quantification of the mass contribution of each source. The purpose of this study was to estimate quantitatively the source contributions to the atmospheric SPM as measured in three sites in Korea that represented urban residential, suburban and industrial areas. The techniques of principal component analysis and step-wise multiple regression analysis were employed to identify and quantify the major sources of atmospheric SPM. The mass contributions of the different sources were estimated by the calculation of absolute principal component sources with subsequent step-wise regression of the SPM concentrations. The advantages of this procedure over other receptor-modeling methods are: it does not require the prior preparation of a source inventory in the area studied; and it can be executed with conventional, generally-available statistical packages making it relatively simple to use. The results indicate that major sources of SPM in Korea are: soil resuspension; coal- and oil-related combustion; motor vehicles; and secondary sulfates. It is concluded that an extensive source inventory will need to be prepared if further source identification is to be carried out by modeling.

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#### ABSTRACT 21

Causes and Indicators of Indoor Air Pollution.

D Soedirman, Professional Association of Industrial Hygiene, J I Jend A Yani 69/70 Jakarta, Indonesia.

Air pollution in offices and related buildings has been increasingly noticed especially where these buildings are highrise. This appears to be the result of their enclosed nature and their integrated-interconnected air conditioning systems, which may, or may not, have recirculation of air or a fresh air supply. Poor indoor air may be the result of an inappropriately designed air conditioning system; that is, one that simply provides low temperatures and humidity using recirculation but that has no fresh air supply or exhaust. This may reduce the oxygen content and cause contamination by unpleasant odours and harmful substances originating from other rooms in the building. It may also result from excessive cigarette smoke, or the introduction of polluted outdoor air. A survey on indoor air quality carried out in a brand new modern highrise building has shown some indicators of poor indoor air quality: a decrease in oxygen content by 17%, a noticeable unpleasant odour due to cigarette smoke and skin dehydration.

Action to improve indoor air quality needs to be taken immediately to prevent the anticipated increase in this problem.

2025826021

ABSTRACT 22

Indoor Air Quality of Urban Shopping Facilities.

Umar F Ahmadi and Izhar M Fihir, Faculty of Public Health,  
University of Indonesia, Depok, Indonesia.

A study of indoor air quality was conducted to determine the level of air pollutants in three different types of shopping facility: traditional; multi-storey without air conditioning and modern with centralized air conditioning. The levels of five air pollutants were used as indicators of indoor air quality: suspended particles; carbon monoxide; hydrogen sulfide; ammonia and an aldehyde. The level of pollutant depended upon the type of facility such that the level of total suspended particles was found to be highest in traditional shopping facilities, while the level of carbon monoxide was higher in the multi-storey and modern than in the traditional facilities. The aldehyde and ammonia were detected only in the multi-storey facilities without air conditioning. The level of each pollutant appeared to depend upon the characteristics of, and main activities in, each of the facilities.

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ABSTRACT 23

Radon Levels in Underground Railway Stations.

Y S Kim and D-S Kim, Institute of Environmental & Industrial Medicine, Hanyang University, Seoul, Korea and Department of Environmental Science, Kyung Hee University, Seoul, Korea.

To determine whether there are daily or seasonal variations in airborne radon-222 concentrations and, thereby, to attempt to locate radon sources, a survey was carried out in the 74 underground railway stations in the Seoul metropolitan area. Each station is constructed from concrete with two or three storeys that are ventilated both naturally and mechanically. Three determinations, which each took 1-4 weeks, were carried out: from July to August 1989; in January 1990; and in February 1991. The mean radon concentration in underground platforms was 3.5 pCi/L (130 Bq/m<sup>3</sup>), whereas the mean radon level varied from 0 to 18.3 pCi/L (677 Bq/m<sup>3</sup>) above ground. In 9% of the stations the level exceeded 8.0 pCi/L (296 Bq/m<sup>3</sup>).

2025826022

ABSTRACT 24

Standardization of the Measurement of Asbestos Fibres in Indoor Air.

Norbert Hoefert, VBT Kammission, Reinhaltrug der Luft, Graf-Recke-Strasse 84, Postfach 1139, Dusseldorf 1 - 4000, Germany.

This year (1991) the Federal Government of Germany passed a resolution banning the import, production and use of asbestos until the end of 1994 in order to eliminate the known health hazards of exposure to airborne asbestos. As early as 1979, the application of sprayed asbestos, formerly a widely-used construction material, was banned because of its enormous fibre-releasing potential. In 1989, the so-called "Asbestos Guidelines" were issued and introduced as technical construction regulations in the federal states with the intention of protecting persons who are exposed to indoor atmospheres of buildings in which low density asbestos products (density  $< 1000 \text{ kg/m}^3$ , asbestos percentage  $> 60\%$ ) have been used as construction materials. The objectives of measuring indoor asbestos are: to determine the current fibre load situation; to determine the fibre concentration after abatement measures have been carried out; to determine which persons are exposed to asbestos fibres during abatement measures.

The majority of such measurements is performed according to Guideline VDI 3492 part 1 (SEM method). However, because this was originally intended for ambient air measurements, different procedures for performing indoor measurements were developed, but with lack of skill and experience on the part of the operators, questionable results have arisen. This situation induced a working group of the "Commission on Air Pollution Prevention in VDI and DIN" to produce a guideline which standardizes the procedure for indoor measurements in order to yield measurements that are representative, comparable and reliable.

2025826023

ABSTRACT 25

The Contamination of Indoor Air with Asbestos and Man-Made Mineral Fibres.

J A Hoskins and R C Brown, MRC Toxicology Unit, Woodmansterne Road, Carshalton, Surrey, UK.

The increased need for asbestos as a thermal insulant early this century resulted in massive exploitation of natural mineral fibre materials. The mineral serpentine chrysotile is the principal commercial asbestos with some contribution by amphiboles. Enormous quantities have been used and, as a result, asbestos fibres have become ubiquitous in the troposphere. The adverse health effects found to be produced by these boosted the development and production of novel man-made mineral fibres. This was not only because of the need for newer, more thermally-stable, or lower density, materials but also because of the need for a safe fibre to replace asbestos. However, regardless of what fibre materials are used in the future, mineral fibres will continue to contaminate indoor air and would continue to do so even if the use of mineral fibres ceased. Their use is so widespread that most, if not all, buildings contain some fibres, frequently present in a form that permits them to be shed into the air. Although, overall, the concentration of fibres in indoor air is the same as in outdoor air, there can be localised high concentrations resulting from industrial activity, from decaying building materials or from busy roads. While the risk to health from the level of mineral fibres normally found indoors is immeasurably low, this is not so for higher concentrations. The consequences of high levels of air-borne fibres and the need for monitoring and controlling them will be discussed with special reference to Asia.

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ABSTRACT 26

Asbestos Concentration in Indoor Air and During Asbestos-Removal.

Susumu Toda and Mikiharu Aoyagi, Occupational Health Service Center, Japan Industrial Safety and Health Association.

Environmental pollution due to asbestos is now considered to be a great problem in Japan. This pollution is attributable to buildings with asbestos-sprayed walls. Indoor air asbestos measurements in 314 rooms of 142 buildings such as offices, public places and private apartments were carried out from December 1987 to March 1990. These measurements included: analysis of building materials to determine whether or not asbestos was present; quantitative analysis of the asbestos content in the materials and airborne asbestos concentration inside the buildings.

Of the rooms surveyed, engine rooms and gymnasiums were polluted with asbestos at the highest concentrations. During asbestos removal, asbestos concentrations in approximately 30% of the spots exceeded the allowable level. Although the airborne concentration of asbestos generally decreased after its removal, it remained high in a few cases.

2025826024

ABSTRACT 27

Control of Dust in Small Cement Factories with Shaft Kilns.  
Guang-quan Liu, Jiang Liu & Chen Zhou, Institute of  
Environmental Health and Engineering, Chinese Academy of  
Preventive Medicine, 29 Nan Wei Road, Beijing 100050, China.

A large amount of dust is generated in various processes of cement manufacture and the indoor and outdoor air pollution caused by such dusts have resulted in hazardous effects on both human health and the environment. A study was conducted to determine the appropriate ventilation techniques for controlling dust emission effectively by examining the design of exhaust hoods and dust collectors. Because the conditions and properties of dust from exhaust ventilation systems differ from each other, different types of dust collectors must be selected to meet specific dust requirements. Comprehensive surveys to measure the particle size distribution of dust and the character of dust-laden gas (for example gas temperature, gas moisture content or dew point temperature and dust concentrations) for six processes were carried out and, as a result, the particle size fractional collection efficiencies of dust collectors were calculated. Taking the economical and management situations into consideration, the best available dust collectors and their alternatives to be used for these processes will be discussed and recommended. In addition, the use of ventilation pipes to prevent deposition of dust in these pipes will be presented.

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ABSTRACT 28

Threshold Limit Values: A Hazardous Export.  
B I Castleman, 1722 Linden Avenue, Baltimore, MD 21217, USA.

Major criticisms have been published in recent years about the suggested occupational exposure limits known as the Threshold Limit Values (TLVs). These limits are issued by a private, voluntary committee in the USA, and, since 1970, this committee has included industrial employees; for more than 80 of 135 substances, the task of assigning a TLV has been the responsibility of representatives of multinational chemical companies that manufacture the substance. This process has been criticized for its: extensive reliance on unpublished communications from financially-interested parties; incomplete basis in published medical literature; tendency to be reviewed infrequently (and therefore to be outdated); failure to act correctly on referenced publications; failure to select TLVs at levels where no effects were reported in referenced publications; failure to have appropriate conflict-of-interest guidelines and financial disclosure procedures; failure to protect workers exposed to common carcinogenic substances from lifetime occupational cancer risks in excess of 1 in 100. These criticisms have raised worldwide concern over the reliance on TLVs as government standards in many countries.

2025826025

ABSTRACT 29

Air Concentrations of Pyrethroids in dividing and packing workshops.

P Yao, J Sun, Y Wu, S Wang, L Liu, F He, Institute of Occupational Medicine, CAPM, Beijing 100050, P R China.

A health survey was conducted on 199 workers engaged in dividing and packing pyrethroids. Air was sampled 2 to 12 times in dividing and packing workshops over a two year period for fenvalerate and deltamethrin, which were collected on fiber filters, and then extracted and determined by gas chromatography. It was thus shown that workers were exposed to 0.012-0.055 mg/m<sup>3</sup> fenvalerate and 0.005-0.012 mg/m<sup>3</sup> deltamethrin in the air for 0.5-4.5 months. Two thirds of workers experienced burning sensations and tightness or numbness on the face and one third had sniffs and sneezes. Abnormal facial sensations, dizziness, fatigue, and miliary red papules on the skin were noticed that were more evident in summer than in winter. Neither abnormalities in other organs or systems nor symptoms or signs of acute pyrethroid poisoning were found by interviews, examinations, or laboratory tests. There were no significant differences in the plasma levels of NA, cAMP, and cGMP between the examined and control groups. The urine concentration of fenvalerate in the study group ranged from 1.0 to 18.6 µg/L; deltamethrin in the urine was present in trace amounts. The effect on health of these concentrations of fenvalerate and deltamethrin will be discussed.

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ABSTRACT 30

Industrial pollution, an important external source of indoor air pollution.

Le Van Trung, National Institute of Occupational Health, Hanoi, Vietnam.

Industrial pollution is becoming more and more severe. The pollutants most frequently found in the workplace are: dust; noise; and toxic chemicals including Pb, CO, Cl<sub>2</sub>, HF, SO<sub>2</sub>, SO<sub>3</sub>, H<sub>2</sub>S, CS<sub>2</sub>, As, Hg, nicotine, and pesticides.

The concentration of respirable dust with a high content of free silica often exceeds the MAC, which can result in the development of silicosis.

In some industries, and especially in textile mills, the noise level is persistently higher than the TLV and can give rise to noise-induced hearing-loss.

Pollution due to toxic chemicals can induce occupational poisonings.

The causes, consequences and means of control of industrial pollution will be analyzed.

2025826026

ABSTRACT 31

Health Problems in a Thermoelectric Plant.

Nguyen Do Nguyen<sup>1</sup>, Pham Ngoc Len<sup>2</sup> and Nguyen The Dung<sup>3</sup>.

<sup>1</sup>26 Trinh Hoa, Ouc Street, Binh Thanh District, Hochiminh City, S Vietnam. <sup>2</sup>138A Giang Vo Street, Hanoi, S Vietnam.

<sup>3</sup>107/34, 312 Street, District X, Hochiminh City, S Vietnam.

Although the dust and smoke generated by the NINH BINH thermoelectric plant, which uses coal as the source of energy, constitute a hazard both to those working at the plant and to those living in the surrounding township, the injuries and diseases associated with this type of technology was not recognised until a recent study was conducted. As a result of this recognition, control measures have been introduced, but to little effect. Despite this, the plant continues to function because of its high productivity.

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ABSTRACT 32

An Occupational Health Survey in Establishments Exposed to Motor Vehicle Emissions.

L C Somera, College of Public Health, University of the Philippines, Manila 1000, Philippines.

Abstract not available at the time of going to press.

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ABSTRACT 33

Protection of Indoor and Outdoor Air at Work from Highly Toxic Substances.

N Z Bitcolov and V Y Zharkov, Laboratory of Industrial Aerology, Research Institute for Sea Transport Hygiene, Leningrad, USSR.

Protection of the environment in buildings where highly toxic substances are handled has to be two fold: first, under normal working conditions; second, under accident conditions that could lead to destruction of the building, equipment, ventilation, and/or air purification systems.

Under normal conditions, the quality of indoor air of such industrial premises is provided by adequate building planning (including the creation of one, two and three zones), localization, pressurization of equipment, and design of local and general ventilation systems.

To avoid contamination of the environment under accident conditions, the release of contaminants should not exceed the maximum allowable level. This is achieved by having an appropriately sized safety zone and by controlling the maximum permissible amount of harmful substances that can be released into the atmosphere simultaneously. With the use of filters, accumulation of contaminants in any one volume of air can also be limited. In addition, limitation of the risks under accident conditions can be achieved by decreasing the volume of air released into the environment by using partial air recirculation.

2025826027

ABSTRACT 34

Indoor Noise Levels.

S E Lee, School of Building and Estate Management, National University of Singapore, Singapore.

The acoustical performance of buildings is not yet considered to be of sufficient importance to the quality of the indoor environment in most of the developing world to have been incorporated into building regulations. The need to ensure acoustical performance in buildings will be discussed, and current research undertaken in Singapore on the development of new acoustic criteria for different architectural spaces including industrial properties, offices, educational buildings, residential properties, and health institutions, will be described. Results have shown that criteria established by western developed nations frequently do not meet the needs of a developing country, particularly where its climatic conditions are different from those in the west. The findings of this project are likely to be useful not only in Singapore but also in neighbouring countries that have the same type of cultural background and climatic conditions.

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ABSTRACT 35

Further Analyses of the Role of Confounding Variables in Epidemiologic Studies of Environmental Tobacco Smoke (ETS) and the Respiratory System in School-Age Children.

R J Witorsch, J M Wu, R D Hood, P Witorsch. Virginia Commonwealth University, Richmond, Va; New York Medical College, Valhalla, NY; University of Alabama, Tuscaloosa, Ala; George Washington University, Washington, DC, USA.

An analysis of 21 potential confounding variables is underway to explain the lack of consistent association between parental smoking and respiratory effects in 45 clinical and 38 physiologic epidemiologic studies involving school age or older children (1). A systematic protocol has been developed for the extraction of information from epidemiologic studies that is adaptable to computer-assisted analysis.

Socioeconomic status and indoor pollution, considered in 75% and 50% of the studies, respectively, exhibited minimal influences, if any, on the child's respiratory system in this database. On the other hand, the subject's own and familial respiratory health history were consistently associated with adverse effects on respiratory endpoints (2). Marked variation was observed from study to study in the consideration of the 21 potential confounding variables in this series of studies. Depending upon the variable, they were considered in most (about 75%), some (25-50%), or few (0-20%) of the studies. The current report extends this analysis to other confounding variables frequently considered in these epidemiologic studies, namely outdoor pollution, family size, home heating method, area of residence, age, gender, and active smoking. Of particular interest is whether these factors exhibit direct associations with clinical and functional endpoints and/or influence apparent ETS effects.

References

1. HOOD R D et al. Indoor Environment 1992; 1:46.
2. WITORSCH R J et al. Indoor Environment 1992; 1:47.

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